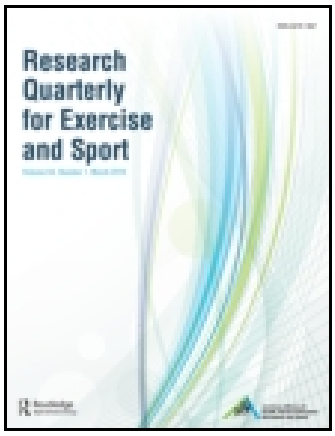

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Physical Education Teacher Effectiveness in a Public Health Context

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The health benefits of physical activity are well documented, and the important role that schools and physical education (PE) can play in reducing sedentary behavior and contributing to population health has been identified. Although effective teaching is ultimately judged by student achievement, a major component of teacher and school effectiveness studies has been student engagement. Thus, in PE, it is important to assess the teaching and learning processes related to expected outcomes, including what students and teachers do and how lessons are delivered. Within a public health context, it is then important to assess how teachers provide students with ample health-enhancing physical activity to help them become physically fit and to learn generalizable movement and behavioral skills designed to promote physical activity and fitness outside of class time. In this article, we emphasize that the future of PE in our nation's schools will depend on the ability of schools to provide programs that are perceived to be of importance to the public; moreover, we believe that the future of PE rests on the effectiveness of PE teachers to operate within a public health context. In addition, we also provide a summary of teacher effectiveness research within a public health context and offer visions for the future assessment and evaluation of PE teacher effectiveness that move beyond the PE lesson to include components of the comprehensive school physical activity model.

Keywords: physical activity, physical fitness, schools, SOFIT

Although questions about teaching effectiveness are not new to physical education (PE), we contend that the PE teacher effectiveness literature has generally lacked a curricular outcome focus. Thus, many of the notions about PE teaching effectiveness in the profession are substantially muddled. Toward this end, we believe that both the subject matter of PE and the notions of PE teacher effectiveness should be generally focused within a public health context.

The health benefits of physical activity during childhood and youth are well documented (U.S. Department of Health and Human Services [USDHHS], 2009), and the important role that schools and PE can play in reducing sedentary behavior and contributing to population health has been identified (e.g., Institute of Medicine [IOM], 2013; Pate et al., 2006; USDHHS, 2012). The authors of the 1991 landmark paper "Physical Education's Role in Public Health" (Sallis & McKenzie, 1991) and its follow-up, "Physical Education's Role in Public Health: Steps Forward and Backward Over 20 Years and HOPE for the Future" (Sallis, McKenzie, et al., 2012), have strongly argued that schools are the most cost-effective public health resource in which to address inactivity and that physical educators are uniquely well positioned to provide and promote physical activity. In this regard, we believe that the survival of PE programs in schools will depend largely on how effective PE teachers are in operating within a public health context.

Not all PE programs are aligned with public health objectives, but the term HOPE Health-Optimizing Physical Education (HOPE) has recently been used to describe PE

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programs that focus specifically on aspects most likely to advance public health goals (Metzler, McKenzie, van der Mars, Barrett-Williams, & Ellis, 2013a, 2013b; Sallis, McKenzie, et al., 2012). In short, HOPE includes curricula and instruction that: (a) provide ample enjoyable opportunities for physical activity during class time; (b) teach generalizable movement and behavioral skills; and (c) encourage present and future physical activity and physical fitness. We believe that these are legitimate public health goals for PE at all grade levels and for programs that offer classes of varying frequencies and lengths. Other nationally recommended goals for PE (e.g., social and emotional outcomes) are also important, but they are assigned lower priority because they are the responsibility of all school curricular areas, not just PE. Meanwhile, PE is the only subject matter to specifically target physical fitness and motor skills, and it provides the only opportunity (and requirement) for some children to engage in health-enhancing physical activity, especially at high-intensity levels.

Effective teaching is ultimately judged by the achievement of learning outcomes, and to date, the effectiveness of PE teachers in helping students reach public health outcomes has received little research attention. This is due in part to a lack of curricular focus and to numerous contextual barriers that are common to the delivery of school PE programs (McKenzie & Lounsbery, 2009; National Association for Sport and Physical Education [NASPE] & American Heart Association [AHA], 2012). Bulger and Housner (2009) concur, and while identifying the many complexities and challenges of moving PE forward, they suggest that a multidimensional approach (e.g., systemwide modifications to teacher preparation and staff development) is needed to make substantive and meaningful change in current PE programs. Thus, the assessment of teacher effectiveness relative to public health goals must consider factors far beyond the classes that are taught, especially considering the central role teachers play within comprehensive/coordinated school health programs (Centers for Disease Control and Prevention [CDC], 2011; IOM, 2013).

In this article, we identify the importance of active PE, discuss the evaluation and assessment of PE teacher effectiveness within a public health context, and make the case that it is essential to the future of PE. Next, we provide a summary of teacher effectiveness research in a public health context, and later, we offer visions for the future assessment and evaluation of PE teacher effectiveness that move beyond the gym and into the comprehensive school physical activity model.

IMPORTANCE OF ACTIVE PE

Physical activity during PE is not only important for its current health implications, but also because students cannot become either physically skilled or physically fit during PE unless they engage actively. Thus, from a public health view, we believe that PE is a vital source of physical activity and its lifelong promotion. Additionally, in the absence of this public health focus, we believe the PE profession will continue to struggle for relevance in an ever-increasing high-stakes educational environment. To support our position, we provide an overview of the importance of physical activity and its provision in PE.

Many of the founding fathers of the PE profession in the United States were medical doctors, and the promotion of health and promotion of physical fitness have been goals of PE since its beginning (Siedentop, 2001). The emphasis on physical activity in PE, however, is more recent and is based on new discoveries of the importance of physical activity to health promotion and disease prevention in children as well as adults (USDHHS, 2009). Habitual physical activity by youths, for example, is positively associated with most health-related fitness components, and increases in physical activity and fitness are related to improved measures of health (IOM, 2012; Strong et al., 2005). In addition, reviews show physical activity reduces the risk for cardiovascular disease, being overweight, and Type 2 diabetes, and vigorous activity helps increase the strength and density of bones. Improvements in flexibility, muscular strength, and bone health not only contribute to movement and sport-related performance, but are also thought to be related to reduced back pain and fractures in adulthood (Malina, Bouchard, & Bar-Or, 2004). Vigorous physical activity (VPA) may also help improve psychological health and mood and can assist in reducing blood pressure and increasing high-density lipoprotein (HDL) cholesterol among high-risk youths (Strong et al., 2005). Additionally, there is also some evidence to suggest that fitness (Trudeau, Shepard, Arsenault, & Laurencelle, 2003) and physical activity behaviors established early in life track into adulthood (Malina, 2001).

The *2008 Physical Activity Guidelines for Americans*, the first-ever national guidelines for the U.S. population, recommend that children and adolescents engage in 60 min or more of physical activity daily, mostly at the moderate- or vigorous-intensity levels (USDHHS, 2009). These guidelines also recommend that young people engage in vigorous-intensity activity, muscle strengthening, and bone strengthening at least 3 days a week. These guidelines are directly aligned with the objectives of HOPE, which promote physical activity as a mainstay of the PE curriculum. Physical activity during PE is especially important for those living in disadvantaged communities who typically have fewer opportunities for physical activity outside of classes as well as for those at increased risk for cardiovascular disease, diabetes, obesity, and osteoporosis.

Active PE is gaining increased support within the PE profession and among state education agencies. The *2012 School Health and Policies and Practices Study*, for example, reported the percentage of states funding or

offering professional development during the 2 years preceding the study increased from 28.0% to 66.7% for methods to improve the amount of class time students engaged in moderate-to-vigorous physical activity (MVPA; USDHHS, 2013). The initial stimulus for active PE, however, was led by the numerous health agencies and organizations external to the PE profession that issued statements recommending frequent and active classes. These included the American Academy of Pediatrics, Council on Sports Medicine and Fitness, and Council on School Health (2006), AHA (Pate et al., 2006), CDC (1997), and the USDHHS (2000). *Healthy People 2020: Health Objectives for the Nation*, for example, which establishes the most important public health goals for the United States during the next decade, continues to include several objectives that strongly support the promotion of physical activity on school campuses, including within and outside of PE classes.

Additional recent support for active PE comes from the IOM (2013) in its extensive report, *Educating the Student Body: Taking Physical Activity and Physical Education to School*. This report strongly recommends that a "whole school" approach be taken to promote physical activity and that 50% of the recommended daily 60 min of MVPA be provided during the regular school day. The document further recommends that PE be designated as a core subject matter and that students be engaged in MVPA at least 50% of PE class time. Among the important additional recommendations are that steps be taken to ensure: (a) equity in access to PE, (b) extensive preservice training and professional development in active PE, and (c) that both PE and other physical activity programs be monitored regularly.

In summary, there is tremendous support for active PE from outside the profession and its popularity is growing from within. In the next section, we introduce the idea that the notions of teaching effectiveness historically have not considered *what* PE teachers teach but have instead focused almost exclusively on *how well* they teach. We contend that the determinations of teaching effectiveness must also include a curricular context and that in PE, the context should be a public health one. We also provide an overview of a tool that was designed to assess PE lesson time relative to its potential for reaching public health outcomes and present some findings related to physical activity during class time, opportunities for fitness and motor skill development, and teacher promotion of physical activity outside of the lesson.

PE TEACHER EFFECTIVENESS WITHIN A PUBLIC HEALTH CONTEXT

Research in PE teacher effectiveness in a non-public health context has been summarized previously in textbooks (e.g., Siedentop & Tannehill, 2000) and in articles in this issue of *Research Quarterly for Exercise and Sport*. For the most part, it has paralleled classroom teacher effectiveness studies (e.g., teacher characteristics, interaction analysis) but lagged behind it by several years, including Cheffers's Adaption of the Flanders Interactional Analysis System (Cheffers & Mancini, 1989) and Academic Learning Time–Physical Education (ALT–PE; Parker, 1989).

These studies have been generally helpful in characterizing effective teaching in PE, but they have done so without focusing on a particular curricular or outcome context. As a crude example, teachers whose lessons had higher engagement in ALT–PE and lower levels of management were deemed to be more effective. As well, much of the PE teaching effectiveness literature describes student subject matter engagement as a proxy measure for learning without consideration of the subject matter itself. From this research, replicable characterizations of what differentiates more and less effective teaching have emerged; the research, however, has not considered *what* teachers are teaching and whether the process or outcomes help or hinder PE—especially PE's potential to contribute to public health goals.

Student engagement in relevant content has had a long history in teacher effectiveness studies (Christenson, Reschly, & Wylie, 2012); and as previously indicated, PE teacher effectiveness in the context of public health should be judged primarily by student outcomes related to health, especially their engagement in physical activity and physical fitness and motor skill development. Unfortunately, few studies have assessed the long-term effectiveness of PE for any outcomes, including those relevant within a public health framework (e.g., Lonsdale et al., 2013; Pate, O'Neill, & McIver, 2011; Trudeau, Laurencelle, Tremblay, Rajic, & Shephard, 1999). Meanwhile, numerous studies have assessed the conduct of PE lessons for their potential to contribute to public health outcomes, at least in the short term. For example, physical activity during class time has been measured using heart rate monitors, pedometers, accelerometers, and numerous observational systems. Because of limited space and the complexity and variability of the different measurement techniques, systems, and variables (e.g., step, counts, heart rates, cut points, and estimations for energy expenditure and activity categories such as MVPA and VPA minutes and proportion; e.g., Sallis, 2009; Welk, 2002), discussion will be limited primarily to findings from the direct observations of lessons that provide information on student activity levels, lesson contexts, and teacher behavior. In the paragraphs that follow, we provide an overview of one observation tool (System for Observing Fitness Instruction Time [SOFIT]; McKenzie, Sallis, & Nader, 1991) that was designed to assess student engagement in PE lessons relative to their potential for reaching public health outcomes, and we present some findings related to student physical activity, opportunities for fitness and motor skill development, and teacher promotion of physical activity outside of the lesson.

Background and Overview of SOFIT

Direct observation has been a mainstay of PE teacher effectiveness studies (Siedentop & Tannehill, 2000) and is especially important because of its ability to generate information on how students are performing during classes, how lessons are being delivered (context), and how teachers spend their time (McKenzie, 2010). Since the 1970s, there has been a proliferation of observation systems developed for assessing PE and coaching environments, and a collection of these was included in *Analyzing Physical Education and Sport Instruction* (Darst, Zakrajsek, & Mancini, 1989). The diversity of these systems illustrates the widespread notions of what has constituted student learning in PE over time, often referred to as PE having a "muddled mission" (Pate & Hohn, 1994).

None of the 32 instruments described in that volume, however, examined PE instruction from a public health viewpoint. In contrast, in the late 1980s, SOFIT (McKenzie et al., 1991) was designed specifically to assess the effectiveness of two large-scale, health-related PE interventions funded by the National Institutes of Health—Child and Adolescent Trial for Cardiovascular Health (CATCH; McKenzie et al., 1996) and Sports, Play, and Active Recreation for Kids (SPARK; McKenzie, Sallis, Kolody, & Faucette, 1997). SOFIT enables researchers and practitioners to make judgments about the effectiveness of PE lessons, particularly as they relate to program goals. It is a comprehensive tool that provides for the simultaneous collection of data on student activity levels, the lesson context, and teacher behavior. As identified earlier, physical activity engagement is a main goal of HOPE, and it is needed for students to become physically skilled and physically fit. Meanwhile, physical activity during class is highly dependent upon the curriculum (i.e., PE content), how it is delivered (i.e., lesson context), and how the instructor delivers it (i.e., teacher behavior). The PE teacher has responsibility in each of these areas, and thus, using SOFIT to observe lessons serves as a strong measure of instructional effectiveness within the HOPE or public health model.

An advantage of SOFIT for health behavior researchers is that its physical activity codes have been validated in several ways (heart rate monitoring, accelerometers, pedometers), permitting energy expenditure scores to be estimated. As well, numerous studies have shown that the tool can be used reliably in diverse settings from preschools to high schools and in lessons using differing instructional formats (e.g., adventure education, sport education, direct instruction). It has been used to provide objective baseline and intervention data on both outcome and process variables. Outcome variables related to student physical activity include the number of minutes and percentage of lesson time they spend in MVPA, VPA, lying down, sitting, standing, and walking, as well as the estimated energy expenditure per lesson (kcal/kg) and the estimated energy expenditure rate (kcal/kg/min).

Process variables assessed using SOFIT have included: (a) schedule of PE (e.g., frequency and duration of lessons, duration of scheduled and actual length of lessons, and adherence to schedule); (b) lesson context (minutes and percentage of lesson time spent in management, instruction, fitness, skill drills, game play, and other); and (c) teacher behavior (percentage of observed lesson intervals spent actively promoting student physical activity, skill development, and physical fitness—for both during and out of class time).

In addition to the formal SOFIT observation procedures that are typically paced by alternating 10-s observe/record intervals, the SOFIT protocol includes a checklist/rating scale (Physical Education Observation Form [PEOF]) that is completed at the end of the lesson. It includes 10 items believed to be related to student safety and the promotion of physical activity and that include judgments on: (a) the inclusion of a warm-up; (b) the inclusion of a cooldown; (c) students being prompted to be physically active during class; (d) students being praised for active participation; (e) students appearing to enjoy the lesson; (f) students understanding management and instructional tasks; (g) the provision of adequate equipment; (h) group sizes being appropriate to the activity; (i) students being encouraged to participate in MVPA outside of class; and (j) the instructor showing enthusiasm for teaching. Neither the PEOF nor its individual items have been validated, but they do serve as an advocacy tool for quality PE instruction and have been used extensively by teachers to self-monitor their lessons and by school administrators.

SOFIT has stood the test of time and has served as the measurement focus of nearly 100 papers in peer-reviewed English journals as well as numerous theses, dissertations, and program reviews. In the United States, for example, it has been used to compare baseline measures of PE in 36 middle schools in six states (McKenzie et al., 2006), the follow-up effects of an intervention in 120 elementary schools in four states (McKenzie et al., 2003), and the evaluation of a new district PE policy in Los Angeles (Lafleur et al., 2013). SOFIT has also been used internationally, including to evaluate the impact of the national PE curriculum on the teaching of health-related fitness in an English town (Curtner-Smith, Kerr, & Clapp, 1996), as well as to obtain baseline measures of PE in representatively selected elementary (Chow, McKenzie, & Louie, 2008) and secondary schools (Chow, McKenzie, & Louie, 2009) in Hong Kong.

The IOM (2013) recently identified SOFIT as an appropriate surveillance tool for PE across the nation, and advances in technology now permit observational data to be entered, stored, and analyzed using handheld computers, making the methodology now much more appealing. Having consistent training protocols and materials is particularly important in allowing the comparison of PE data among different locations, and the SOFIT protocol and

observer training and assessment videos are now available free for downloading from the internet (see Acknowledgments).

Physical Activity During PE Lessons

In general, there is tremendous variability in both the duration (e.g., minutes per lesson or week) and intensity (e.g., proportion of lesson time spent in MVPA or VPA) of physical activity that students accrue during PE (e.g., Levin, McKenzie, Hussey, Kelder, & Lytle, 2001; Pate et al., 2011). This variability results from numerous factors including lesson goals, content, and placement within an instructional unit; class size, grade level, gender composition, and individual differences among students; lesson location and available equipment and facilities (e.g., size of instructional space); and teacher preparation, skills, and behavior. In one study, regression models indicated that the specific elementary school, schools by semester, and weeks during the year explained more than 33% of the variability in physical activity provided during lessons (Levin et al., 2001). The magnitude of variation was greater for VPA than for either MVPA or estimated energy expenditure. Thus, numerous factors such as those identified in this article need to be considered when assessing teacher effectiveness relative to public health outcomes.

The selection of content (i.e., PE subject matter) by teachers is of particular relevance to student activity accrual because different activities and sports have been shown to produce different activity levels at both the elementary and secondary levels (e.g., Chow et al., 2008, 2009). Similarly, how teachers deliver the content (i.e., the lesson context) is important because students typically are engaged in higher rates of physical activity during fitness, skill development, and game-play contexts than during knowledge and management contexts (e.g., McKenzie et al., 2006; McKenzie, Marshall, Sallis, & Conway, 2000). Thus, a sign of instructional effectiveness is the ability of teachers to be efficient in delivering information and managing students while allocating increased lesson time to more relevant health-enhancing contexts such as actively engaging students in fitness and motor skill development.

Few lessons, unless they focus directly on physical activity accrual, engage students in MVPA during at least 50% of class time (Pate et al., 2011; Sallis, Carlson, & Mignano, 2012), a standard promoted by numerous health entities (IOM, 2013). Lessons are typically longer in secondary schools, resulting in students accruing more physical activity during them. Additionally, students tend to engage in physical activity during a greater proportion of lesson time as they move through the grade levels (e.g., Levin et al., 2001), perhaps because of the lesson content or because teachers spend less time in management and instruction.

Outdoor classes usually provide more physical activity than do indoor classes (e.g., McKenzie et al., 2000, 2006), and at the secondary school level, boys typically accrue more physical activity and at higher intensities compared with girls during both coeducational and single-gender classes (e.g., McKenzie, Prochaska, Sallis, & LaMaster, 2004). Thus, at least from a physical activity accrual view, there are student gender implications, and teachers may need to develop different pedagogical strategies to be effective in promoting increased physical activity among girls. The Trial of Activity for Adolescent Girls provided some examples of how this could be done, including the provision of more nonsport "girl-friendly" activities and providing students with choices in physical activity intensities and competition levels (Webber et al., 2008).

Intervention Effects of Enhanced PE on Physical Activity

Several recent reviews of physical activity interventions (e.g., Kahn et al., 2002; Kriemler et al., 2011; Lonsdale et al., 2013; Pate et al., 2011; Sallis, Carlson, et al., 2012; Trudeau & Shephard, 2005) have shown that numerous interventions have been successful in increasing both physical activity minutes and physical activity intensity levels (e.g., MVPA% and VPA%) during PE. Among strategies identified to be most effective were changes to the curriculum, the selection of lessons to specifically increase physical activity time in PE, and improved teacher management skills. Overall, the studies suggest that teachers can incorporate a variety of strategies to increase their effectiveness in affecting public health-related outcomes; as a result, the IOM (2013) reported that there was sufficient evidence that "enhanced PE" can increase physical activity during school hours among youths. In this case, "enhanced PE" was identified as PE being delivered by well-trained specialists that emphasized instructional practices that provided substantial moderate- to vigorous-intensity physical activity.

Several follow-up studies have indicated that the effects of interventions are sustainable at least for a short time; although without accountability and support for the improved programs, there is a tendency for physical activity in PE classes to regress to baseline levels (Dowda, Sallis, McKenzie, Rosengard, & Kohl, 2005; McKenzie et al., 2003). As well, even though classroom teachers at the elementary school level have shown to improve their PE through training and school adoption of evidence-based programs, the amount and intensity of physical activity in their lessons (as well as fitness and motor skill outcomes) typically falls short of that produced by PE specialists (e.g., McKenzie et al., 2003; McKenzie et al., 1997). Overall results of these intervention studies suggest that to be effective in the public health context, PE teachers need to develop or select appropriate curricula as well as receive substantial administrative and other support for their implementation.

Physical Fitness Development Time in PE

Physical fitness, which has both performance-related and health-related components, is the most commonly measured outcome goal of PE. The performance-related components of fitness, such as balance, coordination, speed, and reaction time, are closely related to athletic performance. The health-related fitness components are primarily connected to biological outcomes, and these are associated with a lower risk for cardiovascular and metabolic diseases (e.g., diabetes). The health-related components, cardiorespiratory (heart/lung) fitness, muscular strength and endurance, flexibility, and body composition are the factors commonly tested in schools. Relative to health in youth, an IOM (2012) review committee recently reported finding substantial evidence supporting specific test items for body composition and cardiorespiratory endurance, adequate evidence supporting musculoskeletal fitness test items, and little evidence for flexibility test items.

As children's physical fitness is strongly affected by factors outside of PE (e.g., heredity, youth sport engagement), relying primarily on student fitness outcomes to determine PE teacher and program effectiveness should be cautioned against. A more appropriate assessment of instructional effectiveness would be to evaluate the actual conduct of PE lessons, such as using SOFIT to assess the number of minutes and proportion of lesson time actually allocated to physical fitness development. Large-scale studies using the instrument show that the amount of lesson time allocated to physical fitness development varies tremendously (McKenzie et al., 2000, 2006).

Motor Skill Development Time in PE

There is evidence to suggest that fundamental movement skill development in children and adolescents is associated with increased physical activity levels, cardiorespiratory fitness, self-esteem, and lower levels of overweight and obesity (Barnett, Morgan, Van Beurden, Ball, & Lubans, 2011; Cliff, Okely, & Magarey, 2011; Lubans, Morgan, Cliff, Barnett, & Okely, 2010). Additionally, some studies suggest that fundamental movement skills are inversely related to weight status (Cliff et al., 2011; Lubans et al., 2010) leading to the notion that the development of motor skills has important implications for improved health. There is also evidence to suggest that perceived self-confidence (self-efficacy) and actual motor skill development in childhood is related to increased physical activity in adolescence (Barnett, Van Beurden, Morgan, Brooks, & Beard, 2009; Lounsbery & Coker, 2008) and young adulthood (Stodden et al., 2008). As participation in most school and community activity programs have at least an implicitly understood requirement for minimal motor competency, we believe that PE must be able to at least increase students' perceived motor skill competency. Meanwhile, however, there is substantial research to show that PE teachers have limited ability to improve the motor performance of their students (Ennis, 2011; Lounsbery & Coker, 2008).

We believe that movement skill development is an important goal for all school levels; however, studies relating to either specific PE teacher or PE program effectiveness on motor skill development relative to public health outcomes have not been published. Doing an effectiveness study in this regard that had substantial generality would be challenging, because no common metric exists that permits the assessment of skill gains that might result from the wide assortment of diverse motor skills (including fundamental movement skills as well as more advanced and specialized ones) and sports being taught in PE and the wide range of student development that exists within skills and classes in schools. As a result, for general comparisons when assessing teacher effectiveness, is important to use a common process measure instead of diverse skill outcomes. This can be done, for example, by using SOFIT to directly observe the opportunities that students receive for motor skill development during PE lessons.

SOFIT measures the amount of lesson time that teachers allocate to motor skill development, and studies using the instrument typically find very limited time dedicated specifically for skill learning, especially at the secondary school levels. For example, large-scale studies in the United States have shown the following proportions of lesson time allocated to motor skill development: elementary schools, 10% to 15% (McKenzie et al., 1995; Nader, 2003); middle schools, 5% to 12% (McKenzie et al., 2000, 2006); and high schools, 3% to 4% (Lounsbery, Holt, Monnot, & McKenzie, 2013; Smith, Lounsbery, & McKenzie, in press). In contrast, observations using SOFIT in representative schools in Hong Kong showed 32% (Chow et al., 2008) and 37% (Chow et al., 2009) of lesson time being allocated for skill development in elementary and secondary schools, respectively. These data strongly suggest that PE teachers in the United States need to make substantial changes in the amount of time they allocate for motor skill development if it is to be a major outcome.

Teacher Promotion of Physical Activity Outside of Class

Given the limited frequency and duration of PE, it is unreasonable for teachers to provide students with their entire 60 min of recommended MVPA daily. Therefore, effective teachers should be expected to promote physical activity engagement outside of class time. Yet, direct observations of teacher behavior during PE lessons using SOFIT have shown that teachers rarely prompt or reinforce student engagement in physical activity, sport, or fitness beyond the PE lesson (e.g., McKenzie et al., 2006). These results are disappointing and suggest the need for a greater

focus in this area during both preservice teacher education and in-service professional development.

PE curriculum within a public health context should explicitly require students to explore physical activity opportunities before, during, and after school as well as within the community. Additionally, more effective teaching practices should incorporate technologies (e.g., pedometry, accelerometry) designed to help students set daily physical activity goals and to monitor their progress. PE teacher effectiveness in this area has a long way to go and PE's general noncommitment to adopting a public health focus has been a major barrier.

PE TEACHER EFFECTIVENESS WITHIN A COMPREHENSIVE SCHOOL PHYSICAL ACTIVITY MODEL

As highlighted throughout this article, a primary barrier to PE's contribution to public health goals is low student enrollment in classes. Once a subject generally required daily in nearly all grades, PE time has been reduced severely with very few students now receiving PE every day (NASPE & AHA, 2012). While advocacy efforts for greater school investment in PE time should continue, the role of the PE teacher must advance beyond scheduled PE class time to protect and optimize the health interests of children in our nation's schools. Hence, from a public health perspective, PE can provide some of the recommended MVPA time, but as we highlighted throughout this article, it cannot provide all the minutes that children need. Therefore, we offer a future vision of the PE teacher that moves beyond the confines of the school PE class into a broader context of being a leader in creating and coordinating comprehensive school physical activity. A discussion of what the assessment and evaluation of PE teacher effectiveness might entail under this dynamic follows.

In the recent IOM report (2013), a "whole-of-school approach," or comprehensive school physical activity, was recommended to help children acquire a minimum of 60 min of MVPA daily. This report suggests that half of those 60 min be provided through daily quality PE and the other half through before, during, and after school programming. Examples of during-school programs include recess and regular classroom activity breaks. Offering walking and other activity programs such as intramurals and/or interscholastic sport programs before, during, and after school were also recommended. Lastly, schools should spearhead building community support to develop safe and sustainable strategies to encourage children's active transport to school. Furthermore, the report acknowledges that the adoption of comprehensive school physical activity requires support and engagement from all school personnel (e.g., administrators, teachers) as well as access to school resources including their buildings, fields, playgrounds, and equipment.

We support the 2013 IOM recommendations and in addition point out the glaring need for PE teachers to play a central and supporting role in implementing them. We believe that in addition to teaching classes, PE teachers will need to champion the comprehensive school physical activity by leading, promoting, coordinating, assessing, and continually modifying programs to optimize broad student participation and engagement in MVPA. Comprehensive school physical activity is clearly ideal, but its implementation will likely occur without PE teachers playing a major role.

Health and its promotion are typically not viewed as school priorities, and without a point person and a supporting infrastructure, comprehensive school physical activity programming is unlikely to be well coordinated, widely promoted, disseminated, or evaluated for its effectiveness. As Amis, Wright, Dyson, Vardaman, and Ferry (2012) astutely described, support for PE and other physical activity-producing programs rely heavily on the attitudes and actions of school principals. Their research showed that principals implement the programs, practices, or policies for which they are held accountable and for those in which they have a personal interest. Additionally, when confronted with a new program or policy request, principals face resource constraints relating to time, personnel, facilities, and overcrowding, and these constraints serve as a default justification for why new programs or policies, including those that relate to physical activity or PE, are likely opposed or unsupported (Amis et al., 2012).

So despite these very real and challenging barriers, how can comprehensive school physical activity be realized? We believe that one way is through a PE teacher's articulated work in leading conversations with the school principal and other teachers. In a recent study, we compared questionnaire responses from pairs of principals and PE teachers from 154 schools in 34 states (Lounsbery, McKenzie, Trost, & Smith, 2011). Most respondents considered PE specialists, district PE coordinators, and principals to be extremely influential sources of program adoption. Additionally, we found that PE teachers not only influenced their own principals, but that they also influenced other teachers, including those beyond their own school. Similarly, principals were also influenced by peers in other schools and by district PE coordinators.

Based on these findings, we believe that PE teachers are a main catalyst for comprehensive school physical activity; however, they must change their roles to do this effectively. To start, they must be able to promote the importance of PE and other physical activity programs in accordance with public health outcomes and broader school goals with their principal and instructional peers. Additionally, they must be able to establish networks of stakeholders including, but not limited to students, parents, and individuals who represent

the business, nonprofit, and private community sectors. In this dynamic, effective PE teachers would create buy-in from community stakeholders and mobilize collaborative efforts to overcome resource barriers to provide well-coordinated comprehensive school physical activity. They would not be able to directly deliver all the programs within the comprehensive school physical activity model themselves, but they would help prepare others to structure and deliver the programs to promote and provide optimal levels of MVPA within the school. In this role, they would need to be dynamic leaders with political savvy able to masterfully anticipate and solve problems to successfully negotiate barriers.

Assessing and evaluating a PE teacher's effectiveness in leading comprehensive school physical activity as we described here would require different considerations. Effectiveness would need to extend to school-level outcomes and, at a minimum, the evaluation of physical activity program opportunity minutes and the number of students participating in them. PE teachers could coordinate regular assessments of programs and, based on the data, recommend modifications. We have conducted assessments of this type in some of our elementary school studies using easy-to-implement tools, and for illustrative purposes, we describe two instruments here.

Structured Physical Activity Survey

The Structured Physical Activity Survey (SPAS) is a tool designed to assess all structured physical activity program opportunities that are provided for students at a school beyond PE classes and recess (Powers, Conway, McKenzie, Sallis, & Marshall, 2002). It provides information on the frequency and duration of the activity programs (e.g., intramural, interscholastic, dance, and club programs), how many boys and girls participated in each, when programs were offered, who sponsored them, and whether or not there was a fee for participating. The PE teacher could complete SPAS through simple daily audits of scheduled structured programs.

Physical Activity Record for Classes (PARC)

The Physical Activity Record for Classes (PARC) was designed to obtain information on physical activity opportunities made available during PE, activity breaks, recess, and active lunch recess throughout the school day. PARC was first used during the CATCH project that involved 96 elementary schools in four states (McKenzie et al., 1994). Data collection could be coordinated by the PE teacher through training individual classroom teachers to record the number of minutes provided to students in their class during PE, structured activity breaks, and recess periods on a regular basis.

SPAS and PARC data can be combined to create a school Physical Activity Program Opportunity Index (PAPOI) score to identify program opportunities for physical activity that a school provides for the average student during a week. The PAPOI summary score (i.e., physical activity program opportunity minutes per student per week) is calculated by summing the total number of minutes of program opportunities for physical activity made available from all activity sources in the school and dividing it by the total student population (i.e., average daily attendance during the targeted week). Note that PAPOI provides information on program opportunities for physical activity, not assessed levels of physical activity themselves. Actual student engagement in MVPA in these programs, which could be assessed by using SOFIT or SOPLAY (System for Observing Play and Leisure Activity in Youth) observations, is likely to be less than 40% of program time.

For illustrative purposes, Table 1 compares two fictitious schools on the amount of physical activity program opportunities they provide. Movers Elementary, which has required daily PE for all students, a few class activity breaks, an extensive intramural program, and noncompetitive dance and martial arts clubs, provides the average student with 349 min of physical activity program opportunities per week. On the other hand, Sloth Elementary schedules PE classes three times per week for Grades 4 to 6 only and has a few classroom-based activity breaks, an interscholastic program, but no intramural or club programs. Sloth Elementary provides

TABLE 1
Comparison of Physical Activity Opportunities at Two Fictitious Elementary Schools Using PAPOI

Movers Elementary School (500 Students)

Source	*Students*	*Days/Week*	*Minutes/ Day*	*Minutes/ Week*
PE classes	500	5	30	75,000
Recess	500	5	30	75,000
Activity breaks	50	5	30	7,500
Intramurals	100	4	30	12,000
Interscholastics	0	0	00	0
Activity clubs	60	4	20	4,800
				TOTAL = 174,300

Note. PAPOI Score = 348.6 physical activity program opportunity minutes per student per week (174,300 min/500 students).

Sloth Elementary School (500 Students)

Source	*Students*	*Days/Week*	*Minutes/ Day*	*Minutes/ Week*
PE classes	500	1	30	15,000
Recess	500	5	20	50,000
Activity breaks	50	5	30	7,500
Intramurals	0	0	0	0
Interscholastics	40	4	60	9,600
Activity clubs	40	1	20	800
				TOTAL = 82,900

Note. PAPOI Score = 165.8 physical activity program opportunity minutes per student per week (82,900 min/500 students).

the average student with only 166 physical activity program opportunity minutes per week, less than half those provided by Movers Elementary. Data from the PAPOI can provide useful information to identify areas of strength and weakness and help to prioritize schoolwide physical activity efforts.

It would be shortsighted to close our discussion on the future of PE and PE teacher effectiveness without highlighting the critical role that policies play. School-, district-, and state-level policies requiring PE and other physical activity programs are catalysts for improving PE and expanding other activity program offerings within a school. Current policies, however, vary widely and generally lack specificity, enforcement, accountability, and funding (Ward, 2011). The IOM (2013) recommends that policymakers at all levels take steps to ensure that programs and policies address disparities in physical activity and that all students at all schools have equal access to appropriate facilities and opportunities for physical activity and quality PE.

Research on school physical activity policy is relatively new and limited, with most studies conducting surveys with distal respondents who lack intimate familiarity with a school's physical activity policies and practices. Recently, we examined school- and district-level PE policies and their implementation relative to amounts of physical activity programming provided during the school day in 65 elementary schools from nine states (Lounsbery, McKenzie, Morrow, Monnat, & Holt, 2013). Results showed that adoption of PE policy had important implications for *other* physical activity program policies and practices. For example, the adoption of a PE policy requiring a specific number of minutes or days of PE per week at district and school levels had important implications for the adoption of recess policies and practices. Having a policy specifying the minutes of PE increased the odds for a school being in the top 40% of schools providing more PE and recess minutes. Schools at least partially implementing a school or district policy for PE minutes had a combined total of 36 to 50 more total PE and recess minutes per week.

In the same study, a policy requiring annual evaluation of PE programs was found to be positively associated with weekly PE time, even though its adoption was rare. Another study also found schools to rarely evaluate their PE programs, yet principals and PE teachers in those schools reported being highly satisfied with their program outcomes (Lounsbery et al., 2011). Thus, we believe that there is emerging and growing evidence that having an annual PE program evaluation is a critical policy that has the potential to improve both the quantity and quality of PE programs. Effective PE teachers will play a leadership role to ensure that important policies are adopted and implemented.

CONCLUSIONS

PE is institutionalized as part of the K–12 education curriculum in the United States and is also one of only five interventions strongly recommended for increasing physical activity by the National Task Force on Community Preventive Service (Kahn et al., 2002). We contend that although it is important for PE to continue to strive for subject matter value and assimilation into an ever-increasing high-stakes educational environment, it should not do so at the cost of forfeiting its foundational roots in health and medicine. In this article, we have summarized the need for PE to have a public health focus and made the case for how teaching effectiveness in PE should be defined, evaluated, and targeted for intervention if public health goals are to be met. We focused specifically on the need for teachers to be effective in implementing PE classes that engage students in ample amounts of enjoyable physical activity that will result in the development of physical fitness and motor skills that will serve them well into the future.

Yet, as also highlighted in this article, teaching does not occur in a contextual vacuum, and it is challenging to separate teacher effectiveness from PE program or school effectiveness. The reality in schools is that there are many barriers to PE's optimal contribution to public health, with the primary ones being administrative support, the frequency and duration of classes, and low student enrollment requirements. Even the most effective teachers cannot promote and provide ample physical activity, improve fitness, or develop generalizable motor skills if students do not actually participate in classes. Hence, like many others, we believe that PE and the role of the PE teacher must expand beyond the gymnasium into classrooms and onto the playing fields before, during, and after school. Notions of PE teacher effectiveness must change to fit this new model, and both the preservice and in-service education of teachers need to be revised accordingly (e.g., Corbin & McKenzie, 2008; IOM, 2013; McKenzie, 2007). We strongly believe that the future of PE in our nation's schools will depend on the provision of programs that are perceived to be of public importance, and in our view, this will depend largely on the effectiveness of PE teachers to operate within a public health context.

As we have highlighted throughout this article, there are numerous barriers that prevent PE from playing a greater role in meeting public health outcomes, including those associated with the structural delivery of PE (e.g., PE facilities [size, location, and amenities], teacher credentials, class size, equipment-to-student ratio, scheduled lesson length, and frequency of lessons). There is a paucity of research evidence that guides any modifiable aspect of PE's structural delivery in schools, and these aspects certainly have either a mediating or moderating effect on teaching effectiveness within a public health context. For example, although some research has been conducted on class size and its relationship to physical activity (e.g., McKenzie et al., 2000), there have been no focused efforts to identify class size thresholds. Additionally, no studies have

examined differential PE scheduling and only a few have assessed the impact of different instructional models in relation to physical activity outcomes. We believe that strategic dissemination and translation of such research could inform practice and policy and go a long way in improving public health outcomes in PE.

WHAT DOES THIS ARTICLE ADD?

Throughout its history, PE has had numerous goals, and recently, there has been substantial support for its contribution in helping to meet public health objectives. Historically, most of the teacher effectiveness research in PE has paralleled, but lagged behind, classroom teacher effectiveness studies. This article is the first to address PE teacher effectiveness specifically within a public health context. It focuses primarily on the notion that PE teachers have prime responsibility for providing substantial amounts of health-enhancing physical activity during class time, especially in those activities that will lead to student physical fitness and motor skill development and serve them well into the future. The article also provides a vision for the assessment of the effectiveness of PE teachers as they move beyond the confines of the individual PE class and into the broader context of being a leader in creating and coordinating comprehensive school physical activity programs.

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The SOFIT observation protocol may be downloaded free from the Active Living Research Web site: http://activelivingresearch.org/sofit-system-observing-fitness-instruction-time. SOFIT observer training videos and an audio-pacing tape can be downloaded free via iTunes University at: http://itunes.apple.com/us/itunes-u/soplay-soparc-3-assessment/id529513043?i=115757894

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